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Federal Communications Commission
Office of Secretary

National Search And Rescue Committee

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Department of Defense
Department of Interior
Department of Commerce
Department of Transportation
Federal Communications Commission
National Aeronautics and Space Administration

Before The
FEDERAL COMMUNICATIONS COMMISSION
Washington, D. C. 20554

In the Matter of	)	
	)	
Amendment of Parts 2 and 25 to Implement	)	IB Docket No. 99-67
the Global Mobile Personal Communications	)	
by Satellite (GMPCS) Memorandum	)	
of Understanding and Arrangements	)	
	)	
Petition of the National Telecommunications and	)	RM No. 9165
Information Administration to Amend Part 25 of	)	
the Commission's Rules to Establish Emissions	)	
Limits for Mobile and Portable Earth Stations	)	
Operating in the 1610-1660.5 MHz Band	)	

COMMENTS OF
THE NATIONAL SEARCH AND RESCUE COMMITTEE

The National Search and Rescue Committee (NSARC), formerly the Interagency Committee on Search and Rescue (NSARC), herewith submits comments regarding the subject Notice of Proposed Rulemaking (NPRM). The NSARC is a federal interagency standing committee chartered to oversee the National Search and Rescue Plan and coordinate development of interagency policies on SAR matters, provide an interface with other national agencies involved with emergency services and provide a forum for coordinated development of compatible procedures and equipment to increase the effectiveness and standardization of SAR operations. The member agencies of NSARC are the Federal Communications Commission, the Department of Transportation, the Department of Defense, the Department of

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Commerce, the National Aeronautics and Space Administration, and the Department of the Interior.

Within the subject NPRM, the FCC asks a number of questions related to distress and safety communications and E-911 requirements for GMPCS and MSS systems which is of obvious interest to NSARC. The NSARC urges the Commission to include MSS systems in the requirements for wireless providers to provide compatibility with enhanced 911 emergency calling systems. MSS phones will be used in remote areas by persons in distress. To provide effective search and rescue (SAR) support it is essential to obtain location information from MSS systems to route distress calls to the proper response agency. A distress call received from an MSS telephone could originate anywhere in the view of the satellite, perhaps across the country from the MSS earth station. This is particularly important for SAR cases in wilderness and remote areas with few landmarks available. The identity and location of the caller is necessary to mitigate false alarms and hoax calls while facilitating the rescue effort.

False alarms from emergency beacons in the maritime area have caused a serious waste and diversion of SAR response resources. This has led to a requirement for a two-action activation to initiate beacon transmission. Access to E911 should not deviate from the normal calling pattern used by wireless phones because direct access without the send key could lead to a plethora of false calls. Without attempting to define the method of control, NSARC urges the Commission to require at least two actions to initiate a 911 call, and rule out the use of a single "panic button" configuration.

As noted by NSARC in a previous FCC NPRM regarding this issue, a national data base

of PSAPs must be created before MSS systems can route distress messages to the satellite ground station must be routed throughout the nation. The National Emergency Number Association (NENA) is developing a national database of PSAPs. The national database of PSAPs and databases containing calling party identification must be maintained to ensure response system effectiveness. The Commission's rules should take this factor into account.

NSARC believes it is essential to establish some priority handling of E911 calls. We also feel that the Commission should take into account the needs of emergency response and rescue personnel to obtain communications service in performance of their duties. It has been the experience of disaster response personnel in emergencies such as hurricanes and earthquakes that potential use of Commercial Mobile Radio Services (CMRS) phones as the only available communication has been severely limited by extensive public system use.

We believe that basic emergency caller information, such as caller ID, Automatic Number Identification (ANI) and Automatic Location Information (ALI) can and should be provided by all wireless systems.

ALI should consist of location information which is already inherent in MSS systems, such as doppler location information and GPS where wireless terminals are equipped with this technology. We realize that location accuracy may not be very precise initially, especially for the first generation of LEO satellite systems, but we are confident that improvements in this area are forthcoming. Every effort should be made by all MSS providers to

immediately provide some form of ALI and to eventually provide precise location capabilities.

We recommend immediate FCC action on the following items:

-Automatic Location Information (ALI)

-Automatic Number Identification (ANI)

-reliable calling and communicating with the RCC

-Signaling System 7 (SS7) implementation

-privacy protection for emergency calls

-compatibility requirements for voice and data

-store-and-forward systems provide operators-geographic area identity for emergency calling

-means of reaching PSAP on 24-hour basis

-emergency call capability on service-initialized units

-labeling requirements

-a distress call procedure that involves at least two steps to reduce inadvertent false alarms

Detailed technical requirements concerning certain information like ALI, call back capability, priority for the caller and routing initially may require further study. However, these studies should not delay the adoption of and proposed rules setting forth general performance criteria.

The NSARC Working Group for Commercial Mobile Satellite Services (CMSS) has developed a paper entitled, "Search and Rescue Disaster Support MSS Capabilities Comparison" paper which identifies which MSS carriers are providing or will be

providing the operational capabilities that the Search and Rescue (SAR) and Disaster Support (DS) communities believe to be essential to support SAR and DS operations. The paper clearly indicates that many of the capabilities of concern are being implemented by the 13 MSS providers contributing information to the paper. A copy of the MSS Capabilities Paper is attached for your information.

Summary

NSARC strongly encourages the Commission to require enhanced 911 capability from GMPCS providers. Recognizing that there may be impediments to the implementation of full E911 compatibility in the near term, we urge the Commission to begin implementation of these requirements. In addition, we urge the Commission to seek innovative ways and means to provide a total system approach to the implementation of a national E911 system.

The following summarizes the NSARC position:

* Require wireless systems to pass 911 calls with ALI and ANI without validation.

* Require at least a two action initiation for 911 calls.

* If an advisory committee is formed, include search and rescue and MSS representation.

* Address the creation of a national data base of PSAPs and the maintenance of all 911 data bases.

* Apply a total systems approach in the implementation of E911 for GMPCS including international compatibility.

- Implement general provisions which are technically feasible and important to safety now, while specific requirements for future enhancements are developed.

DAN LEMON
Secretary, National Search and Rescue Committee

Attachment 1

Search and Rescue and Disaster Support MSS Capabilities Comparison Developed by the ICSAR CMSS Working Group

SEARCH AND RESCUE

DISASTER SUPPORT

MSS CAPABILITIES COMPARISON

DEVELOPED BY THE

ICSAR CMSS WORKING GROUP

April 1, 1999

SEARCH AND RESCUE AND DISASTER SUPPORT
MSS CAPABILITIES COMPARISON
DEVELOPED BY THE ICSAR CMSS WORKING GROUP

A. BACKGROUND AND INTRODUCTION

The Interagency Committee on Search and Rescue (ICSAR) Commercial Mobile Satellite Services Working Group (CMSS) was formed to enable the MSS providers to better understand the needs of Search and Rescue (SAR) and Disaster Support (DS) operations and to gather information and understanding from MSS providers that could be used by the SAR and DS community to fulfill their communications needs in the future. The scope of SAR considered by the CMSS includes Aeronautical, Maritime, Wilderness and Urban SAR areas. Urban SAR, as considered in this effort, is limited to the initial response following such disasters as earthquakes and floods.

The purposes of this paper are to: (1) identify operational capabilities that the SAR and DS communities believe to be essential to support SAR and DS operations; and (2) allow MSS operators with an opportunity to indicate which of these capabilities they either are providing in existing MSS systems or are planning to provide and when.

This document has been prepared from the perspective of the US domestic search and rescue and disaster support operations. Terms used and defined in this document apply to the aeronautical, maritime and land mobile services and may conflict with international protocol and/or standards for distress alerting. Unlike the aeronautical and maritime services, there is no international recognition of distress alerting in the land-mobile service.

The primary objective of Table 1, Distress Alerting and Locating, is to list the MSS capabilities that should be available for persons in distress to summon help in life threatening situations. The primary objective of Table 2, Post Alert MSS Capabilities, is to list the MSS capabilities that should be available to the responders for operational purposes in the execution of a rescue.

B. TABLE 1: DISTRESS ALERTING AND LOCATING

The element of time in rescuing persons from life threatening distress incidents is obviously the main consideration in the design and operation of a distress alerting system. The first receipt of information by the SAR system of an actual or potential distress initiates the SAR effort. The alert must not only be received by the satellite in a timely manner, but it must also be transmitted to the SAR agency (usually a Rescue Coordination Center (RCC)) or other point of contact responsible for the SAR response. The alert message should include the location of the distress, the identification of the distressed party, and points of contact for the transmitter's owner. The scope of SAR activity for Distress Alerting and Locating includes the Aeronautical, Maritime and Wilderness areas.

Table 1 summarizes the MSS capabilities for Distress Alerting and Locating, either available now or planned in the near future. Tables 1A, 1B and1C present matrices summarizing the responses to a questionnaire completed by the various MSS providers. The definition of each capability addressed in the Distress Alerting and Locating matrix is given in Attachment 1.

C. TABLE 2: POST ALERTING PHASE CAPABILITIES

The post-alert matrix is intended to address the potential solutions for MSS systems to support SAR and disaster response operations. The scope of SAR response considered by the CMSS in the Post Alerting phase are the Aeronautical, Maritime, Wilderness and Urban SAR Areas.

A difficult problem often encountered in SAR and disaster response operations is the limitation of current communications support systems. Problems with interoperability restrict the ability of police to talk to firemen, local government personnel to talk to federal agency personnel, etc. The limited range of some systems doesn't allow SAR forces in the field to reach their headquarters. Blockage from terrain can limit communications between elements of a SAR force. These and other communications problems are often cited by emergency response personnel as limiting their effectiveness in SAR operations and in disaster support operations. The MSS systems, by their ubiquitous nature, should offer solutions to many if not all of these problems.

Table 2 summarizes the MSS capabilities in the post-alerting phase of SAR and Disaster Response operations. These capabilities are intended for the use of emergency responders in SAR and disaster situations. Tables 2A, 2B and 2C present a summary of the responses to the questionnaire received from the various providers. The definition of each capability addressed in the Post Alerting Phase is given in Attachment 2.

D. DESCRIPTION OF EACH MSS SYSTEM

Each MSS provider was invited to submit a one page description of its system, highlighting the unique aspects of the system and its ability to support SAR and DS operations. These descriptions are included in Attachment 3. For those MSS Providers whose information was not received, a listing of Web ages is included.

ATTACHMENT 1
DESCRIPTION OF CAPABILITIES LISTED
FOR
DISTRESS ALERTING AND LOCATING MATRIX

1. 2-WAY DATA OR 2-WAY VOICE

This is intended to mean digital data transmitted and received via a data line or a voice link could also be used to transmit digital data. For voice, this does not limit the transmission method, which could be either analog or digital.

2. PSTN OR PSDN COMPATIBLE

For voice and data, the gateway or control center of the satellite system should provide compatibility with the PSTN and/or the PSDN, as appropriate. The intent is to avoid having to install unique terminal equipment in the PSAP or SAR facility.

3. EMERGENCY MESSAGE CAPABILITY/ROUTING MEANS

A method of directing an emergency message to the response center responsible for the distress call area, such as a 911 Public Safety Answering Point (PSAP) or a Rescue Coordination Center (RCC). The message may be routed either automatically or via operator assistance.

4. DATA MESSAGE CONFIRMATION

An alert given by voice automatically receives a confirmation when the call is received.
For data messages, provisions should be made in the system such that the party in distress is given an audible or visual indication that an appropriate responsible person has received their distress call. This capability will enhance the "will to live" of survivors.

5. DATA MESSAGE ACCOUNTABILITY

This refers to data messages only. Message accountability is required to ensure that distress messages are received by the responsible RCC or PSAP and not lost somewhere in the system.

6. CALL BACK CAPABILITY

The ability to restore communications with another party when communications are lost. This does not imply automatic restoration of communications. A telephone number or data address is required.

7. CONNECTIVITY

Connectivity is achieved by using the location of the distress call and situation information when available. This capability allows the routing of distress calls with minimum delay. If this capability were not available the service provider would be responsible for routing of distress calls.

A. Connectivity of a voice call to a responsible party such as a PSAP. For voice systems this refers to the ability to determine which local 911 service covers the location of the user terminal using methods such as geographical sorting and situation sorting.

B. Connectivity of a data message to a responsible party, such as an RCC. This refers to the ability to determine whether the call is a maritime, aeronautical or other emergency in a remote area, and then to connect to an RCC or other responsible party appropriate to that call type and to the location of the caller.

8. POSITION AVAILABLE AT RCC OR PSAP

A. This capability will allow the RCC or PSAP to know the position of the unit identified by its registration number. This feature may be optional; thus, not available in all Automatic Location Identification (ALI) compatibility is required for calls made to a 911 service provider. This information is necessary to plan the response to the distress call.

B. If position is not available to the RCC at this time, will it be available in the future, and if so, when?

9. POSITION ACCURACY: 125m (2d rms. or 95%)

A. POSITION ACCURACY – This refers to the accuracy of the position specified in Item 8. In the notification phase, the position accuracy should allow the routing of the distress call to the proper PSAP or RCC. In the notification phase the position accuracy should allow the routing of the distress call to the proper PSAP or RCC. In the rescue phase the position location should be sufficiently accurate to allow "pinpointing" of the distress victims to allow rescue operations to take place. "Pinpointing" can be accomplished by other than precise location so that rescue can be accomplished successfully (e.g. homing). Two-way communications with

the victim(s) may provide another method of pinpointing, however, the reliance on this method alone is highly controversial. The accuracy should be a 2d rms. or 95% value.

B. ALTITUDE – Indication of altitude in the position data referred to in 9A is desirable.

10. COVERAGE

Coverage should be defined as: (1) truly global with the satellite providing service to and from any point on the globe; (2) Geostationary with complete global coverage except for the poles; (3) Geostationary with regional coverage, and; (4) Non-geostationary coverage with limitations of coverage. Areas where satellite communications are turned off to conserve power should not be included as a part of the "coverage".

11. SELECTIVE POLLING FOR POSITION

This is the ability for the RCC/PSAP to query a unit by its identity code for its position. Other data concerning the unit or its carrier might be considered as advantageous, but not as a requirement at this time. This enables emergency response or SAR personnel to determine the location of a party that is disabled or deceased.

12. DATA MESSAGE ALERTING TIME LESS THAN 5 MINUTES

This time is defined as the time from when a distress message is transmitted to when the PSAP or RCC is notified. It includes any waiting time for satellite coverage as well as any delays introduced by the system. The time taken to sort and route the messages to the PSAP or RCC can be considered negligible. This capability increases the probability of recovering survivors.

13. PRIORITY ACCESS FROM THE MOBILE TERMINAL

This provides the capability of the distress message to gain access ahead of lower priority communication channels when warranted. This does not necessitate preemption of in progress communications but can mean acquiring top priority in the message or call queue.

14. PRIORITY ACCESS TO THE MOBILE TERMINAL

This provides the capability for SAR personnel to gain access to the distressed party ahead of lower priority communication channels when warranted. This does not necessitate preemption of in progress communications but can mean acquiring top priority in the message or call queue.

15. INFORMATION AVAILABLE FROM MSS DATA BASE

The ability to contact someone else related to the distress party (family, friends or home office) can fulfill much of the same objective as call back. This information is expected to be available in the MSS registry as a home and/or office telephone number, and should be available to the SAR forces either with the distress alert or by access to the MSS provider's data base on a 24 hour basis. The type of information which would be valuable includes emergency contact, description of vessel or aircraft, type of equipment and primary use of equipment.

16. SITUATION SORT FOR DATA MESSAGES

The distress message should include information about the type of vehicle (e.g. ship, plane). This allows routing of distress messages to the appropriate responder (in the US: the Coast Guard or the Air Force) with a minimum of delay

17. MOBILE UNIT CALLER ID TO RESCUE CENTER

Caller ID is a desirable capability.

ATTACHMENT 2

SEARCH AND RESCUE AND DISASTER SUPPORT CAPABILITIES MATRIX FOR COMMERCIAL MOBILE SATELLITE SERVICES (CMSS) (POST ALERTING PHASE)

1. 2-WAY DATA AND/OR 2-WAY VOICE

This is intended to mean digital data transmitted and received via a data line or a voice link could also be used to transmit digital data. For voice, this does not limit the transmission method, which could be either analog or digital.

2. FACSIMILE

The ability of the MSS system to receive and transmit facsimile images with appropriate terminal equipment.

3. STILL IMAGES

The ability of the MSS system to receive and transmit a digitized version of a picture with appropriate terminal equipment.

4. VIDEO IMAGERY

The ability of the system to receive and transmit video images generated by a TV camera and encodes them to occupy the available bandwidth.

5. PSTN OR PSDN COMPATIBLE

The gateway or control center of the satellite system must provide the compatibility with the Public Switched Telephone Network and/or the Public Switched Data Network. A requirement for terminal equipment at the RCC/PSAP that is unique to the MSS system is not acceptable.

6. POSITION AVAILABLE AT MOBILE

A. The requirement is to allow the MSS terminal user to determine his position relative to map coordinates as well as provide that location to headquarters or base station personnel via the MSS link.

B. Indication of altitude in the position data referred to in 6A is desirable.

7A. TRANSMIT POSITION VIA MSS LINK

The position of mobile terminal is transmitted via the MSS link to RCC, PSAP or other receiving point.

7B. INCLUDE ALTITUDE?

Indication of altitude in the position data referred to in 7A is desirable.

8. POSITION ACCURACY 125m

This refers to the accuracy of the position specified in Item 6. Indication of altitude in the position data referred to in 6 is desirable.

9. SELECTIVE POLLING FOR POSITION

This is the ability for the RCC/PSAP to query a unit by its identity code for its position. Other data concerning the unit or its carrier might be considered as advantageous, but not as a requirement at this time. This enables emergency response or SAR personnel to determine the location of a party that is disabled or deceased.

10. BROADCAST

The ability of the MSS to select a set of terminals and provide a simultaneous message to the group of terminals addressed. This could be used to alert or recall emergency personnel in a given area.

11. CONFERENCE

The ability to set up conference calls to selected terminals on a private basis as different from a net call where everyone on the net has access.

12. COVERAGE

Coverage is defined as not only the area in view of the satellite system, but also the provision of communication services in the "coverage" areas. Coverage should be defined as (1) truly global with the satellite providing service to and from any point on the globe. (2) Geostationary with complete global coverage except for the poles. (3) Geostationary with regional coverage and (4) Non-geostationary coverage with limitations of coverage. Areas where satellite communications are turned off to conserve power should not be included as a part of the "coverage".

13. CALL BACK CAPABILITY

The ability to restore communications with another party when communications are lost. This does not imply automatic restoration of communications. A telephone number or data address is required.

14. PRIORITY ACCESS/LEVELS

This provides the capability to gain access ahead of lower priority communications when warranted. This does not necessitate pre-preemption of in progress communications and can be accomplished by acquiring top position in the queue of channel requests. Indicate the number of levels of priority that can be provided.

15. VOICE ACCESS CONTROL

This is intended to avoid the problem of system saturation that often occurs in a disaster area. This capability would allow blocking of telephone calls to and from a disaster area when sufficient capacity is not available

16. 911 CALL CAPABILITY

This is intended to indicate the capability for the mobile unit to call an emergency 911 center (PSAP).

17. PROVIDE LOCATION AND IDENTIFICATION TO 911

The capability to provide location and identification information to the emergency 911 center (e.g. ALI and ANI).

18. DATA SERVICES; STORE AND FORWARD

The ability of the system to receive data from one location and deliver it to another location.

DESCRIPTION OF MSS SYSTEMS

American Mobile Satellite Corporation

American Mobile Satellite Corporation launched its first satellite into geostationary orbit on April 7, 1995. Since that time, American Mobile has been committed to delivering communication tools to organizations with remote or mobile operations. The satellite's footprint extends coverage over the continental United States, Alaska, Hawaii, the Caribbean, and more than two hundred miles of coastal waters. Public safety and emergency service agencies utilize American Mobile's SKYCELL® Satellite Dispatch Service and SKYCELL Satellite Communication Services for seamless voice communication in disaster and crisis situations.

SKYCELL dispatch is a real-time, voice-based service that offers digital broadcast dispatch capability. Dispatch service has two-way radio functionality and the reliability, security, and coverage only available with satellite communications. Customized talkgroups allow a dispatcher to simultaneously exchange information with an individual or a select group of workers, as well as support internal and interagency coordination and control.

American Mobile integrates SKYCELL dispatch with its satellite data, voice, and fax communication services. These services include telephone connectivity, e-mail and Internet access, and circuit-switched data transmission.

A variety of equipment and configuration options are available, including land mobile, fixed-site, and transportable applications. American Mobile is the exclusive provider of mobile satellite services in the L-band frequency (which eliminates rain fade and supplies coverage and service regardless of weather conditions) in the United States. For additional information, call 1/800-872-6222 or visit our web site at www.AmMobile.com.

COMSAT, using Inmarsat space segment, offers a wide array of capabilities to support Search and Rescue and Disaster Recovery operations in urban and rural areas on land, at sea and in the air. No other mobile satellite system -- existing or planned -- can match that claim in terms of operational scope and service capabilities.

COMSAT Services. COMSAT provides global, seamless coverage utilizing a four satellite (plus one in-orbit spare) configuration of state-of-the-art "Inmarsat 3" satellites operating at geosynchronous orbit. These recently launched spacecraft support six mobile earth station services (as illustrated in Tables 1C and 2C), ranging from the "Inmarsat A" and "Inmarsat B" services, which provide voice, telex, fax, high speed data and compressed TV capabilities, to the laptop "Planet 1" ("Mini-M") service, which provides voice, data, fax and video. Many of these services have position reporting and encryption capabilities. COMSAT supports these services through around-the-clock worldwide operations at land earth stations in Southbury, CT, Santa Paula, CA, and Kuantan, Malaysia.

Inmarsat Space Segment. The Inmarsat system is highly robust. The "Inmarsat 3" satellites provide overlapping coverage and are backed up by four fully operational "Inmarsat 2" satellites. This mix gives the user a variety of services from which to choose, as well as the option for receiving service, either in an on-demand mode or through full-period leases.

Public Safety Tradition. COMSAT's tradition in providing public safety communications can be traced back to the 1970's with the launching of the world's first MSS -- COMSAT General's "Marisat" system. This pioneer system was dedicated to maritime safety and commercial communications. A unique capability was introduced in the early ship earth stations (SESs) -- a "distress button" -- to insure the ship's captain of instantaneous communications with a Rescue Coordination Center when safety of life and property was at issue. Subsequently, the International Maritime Satellite Organization (Inmarsat), established in 1979, turned to leased "Marisat" satellites to provide a critical component of the new global satellite system's first generation space segment. Because of its demonstrated performance and capabilities, the International Maritime Organization (IMO) selected Inmarsat as the "backbone" communications element of the Global Maritime Distress and Safety System (GMDSS), including the "Inmarsat C" that supports "SafetyNET."

COMSAT's capabilities have evolved to meet the changing requirements of the public safety community. The maritime and land mobile satellite services are almost identical. Land mobile terminals, over the years, have been widely deployed by US disaster recovery and relief organizations, domestically and overseas, and by the Armed Forces in humanitarian missions.

Future. In mid-April 1999, Inmarsat became a commercial company. This restructuring will enhance the capabilities of COMSAT, the major shareholder in Inmarsat, to continue to efficiently and reliably support the Search and Rescue and Disaster Recovery communities.

For further information, call Director/Government Sales, COMSAT Mobile Communications: 1-800-685-7898 (CMC Sales); Fax: 1-301-214-7100 (Communication Center) or 301-214-7284 (CMC Sales); Internet: http://www.comsat.com/cmc/

THE ELLIPSO™ MOBILE PERSONAL COMMUNICATION SYSTEM

The ELLIPSO system falls into the group of satellite cellular service providers licensed by the FCC and generally referred to as Big-LEO systems. Others in the group include Iridium, Globalstar, ICO, and Constellation. The ELLIPSO systems main unique feature is its use of elliptic orbits; all the other systems use circular orbit constellations. The choice of elliptic orbits allows satellite coverage to be tailored to the market's telephone communications requirements. Much more capacity is needed in the daytime than at night-time, and more capacity is needed in the Northern Hemisphere than in the Southern Hemisphere. The ELLIPSO system uses 17 satellites to obtain near global coverage, compared with the larger numbers required for Iridium or Globalstar. It is somewhat more comparable to ICO, that uses circular MEO constellations, but ELLIPSO's orbits are lower and require considerably less launch energy (hence- smaller launch vehicle requirements).

Another characteristic of ELLIPSO is that it has typically considerably higher minimum and average elevation angles (from the user to the satellite) meaning that it is much less affected by multi-path, atmospheric or rain interference than the low altitude Big-LEOs. In the ELLIPSO system, there is no cross-linking between satellites, signals being transferred into the PSTN through a gateway ground control station (GCS) that generally covers a wide region. Independent studies have concluded that the ELLIPSO system enjoys the lowest cost per billable minute of any of the Big-LEO systems. The user terminals for ELLIPSO fall into three categories: hand-held, fixed, and mobile vehicular. It is contemplated that the ELLIPSO system will be well-suited to handle emergency and search and rescue type of telephone calls. The small, hand-held user terminal will be comparable to existing cell phones, offering the user convenience and portability. The user terminals will be dual-use; that is, they will selectively connect to a terrestrial cell phone tower where available (at a lower per minute user fee). If they are out of range of a ground terminal, they would then connect through an ELLIPSO satellite. The ELLIPSO system is scheduled to become operational at the beginning of 2002. Continuous service will be available even before all the satellites are in orbit, due to the incremental deployment of the first of three orbital planes – the equatorial MEO CONCORDIA™ sub-constellation. This constellation is intended to provide service to the tropical regions and the Southern Hemisphere. However, it is capable of serving either Northern or Southern Hemisphere up to approximately 55 degrees of latitude. The other two planes comprise the BOREALIS™ sub-constellation, that provide higher latitude Northern

Hemisphere coverage and extra capacity in the Northern Hemisphere. ELLIPSO's designers have obtained patents on their unique constellations and orbits. In any of the three planes (the two sun-synchronous BOREALIS and the single equaotorial CONCORDIA), the coverage can be tailored to provide augmented daytime coverage (compared to night-time) to better meet the needs of the average telephone customer. Partners with ELLIPSO, Inc., in the implementation of the ELLIPSO system include the Boeing Company, Lockheed-Martin, L3-Comm, Arianespace, and the Harris Corporation.

Leo One is a constellation of 48 low-Earth orbiting satellites designed to provide high quality, ubiquitous coverage on a worldwide basis. One or more satellites will virtually always be in view of a user.

Leo One is a store-and-forward data communications system supporting subscriber data rates of up to 9,600 bps for the uplink and 24,000 bps for the downlink. The communications links operate in the VHF and UHF frequency bands thus benefiting from superior propagation characteristics while enabling the production of low cost user equipment.

The Leo One system is designed to support Search and Rescue requirements and is uniquely optimized to provide a world-wide, near-real-time communications capability. Communications are two-way with Message Confirmation, Selective Polling, Priority Access, inherent Situation Sorting, and much more. GPS positioning will also be supported.

Leo One expects to launch its first satellites in 2000 with the commercial service commencing in 2001. The full constellation will be operational in the

second quarter of 2002. For further information please visit Leo One at www.leoone.com.

Leo One Satellites

Number	**48, plus spares**
Planes	**8, with 6 satellites equally spaced per plane**
Inclination	**50°**
Altitude	**950 km**
Design life	**5 years, with 7 years of consumables**
Frequencies	**Subscriber uplink 148-150.05 MHz 2.4 to 9,6 kbps**
	Subscriber downlink 137-138, 400.15-401 MHz 24 kbps
	Gateway uplink 148-150.05 MHz 50 kbps
	Gateway downlink 400.15-401 MHz 50 kbps

LISTING OF WEB PAGES FOR ADDITIONAL MSS PROVIDERS

MSS Provider	Web Page
Final Analysis	www.finalanalysis.com
Globalstar	www.globalstar.com
ICO	www.ico.com
INMARSAT	www.inmarsat.org
Iridium	www.iridium.com
ORBCOMM	www.orbcomm.com
Planet One	

Table 1A
GEO and Big LEO MSS Distress Alerting and Locating Capabilities

4/16/99

Capabilities	AMSC Available Now	ELLIPSO Available 4Q 2002	GLOBALSTAR Available 1Q 1999	ICO Available 2000	IRIDIUM Available 3Q 1998
1a. 2-Way Data or 2-Way Voice	Both	Both	Both	Both	Both
1b. Maximum Data Speed	4800 bps	9600 bps	9600 bps	9600 bps	2400 bps
2. PSTN or PSDN Compatible	Both	Both	Both	Both	Both
3. Emergency Message Capability Manual or Automatic?	Yes Dial 911 or ERS	TBD	Yes, Dial 911	Yes, Dial 911	Yes, Dial 911
4. Data Message Confirmation	Yes	TBD	Not Decided	Yes	N/A for Voice
5. Data Message Accountability	Yes	TBD	Not Initially	Yes	N/A for Voice
6. Call Back Capability	Yes	SS7	Not Initially	Yes	Yes
7. Connectivity A. Voice	Yes, AMSC Operators	TBD	Yes, through Gateway	Yes	911 Routing Or GSM
B. Data					
8a. Position Available to Rescue Center	Optional w/GPS	Yes	Yes	Yes/GPS	No
8b. In Future?	Now	2001	After 2000	3Q 2000	No
9a. Position Accuracy 125m	GPS	100 Meters	10 Km (1)	100 Meters	N/A
9b. Altitude?	No	Yes	No	No	N/A
10. Coverage and Service Total Global; GEO Global; GEO Regional; Non-GEO Limits Provide Limitations	GEO Regional	Non-GEO Limits			Total Global
11. Selective Polling for Position	Yes	Yes	Yes	Yes	Yes
12. Alerting Time Less than 5 Minutes	Yes	TBD	Yes	Yes	N/A for Voice
13. Priority Access from Mobile Preemption?	Yes	TBD	Yes	Yes	Yes
14. Priority Access to Mobile Preemption?	Yes	TBD	No	TBD	No
15. Information Available from MSS Data Base	Yes	TBD	Yes	TBD	No
16. Situation Sort for Data Messages (Plane, Ship)	Yes	TBD	Yes	Yes	No
17. Mobile Unit Caller ID to Rescue Center When?	TBD	2Q 2001	Yes 1Q 1999	Yes, System Activation Date	Yes, System Activation Date

Notes:

(1) System has capability for higher accuracy up to 300 meters which could be implemented in the future.

* According to ITU regulations and CFR 47, distress communications in the aeronautical and maritime areas require preemption and no cost communications in the maritime area.

4/1/99

Table 1C
COMSAT Distress Alerting and Locating Capabilities

Capabilities	INMARSAT A&B Available Now	COMSAT AERO Available Now	INMARSAT C Available Now	INMARSAT M Available Now	Planet One Available now
1a. 2-Way Data or 2-Way Voice	Both	Both	Data Only	Both	Both
1b. Maximum Data Speed	64 kbps	2.4 kbps (3)	600 bps (5)	2.4 kbps	2.4 kbps
2. PSTN or PSDN Compatible	Both	Both	Both	Both	Both
3. Emergency Message Capability How Used (1)	Yes	Yes	Yes	Yes	Yes
4. Message Confirmation	Yes	Yes	Yes	Yes	Yes
5. Message Accountability	Yes	Yes	Yes	Yes in Maritime	Yes
6. Call Back Capability	Yes	Yes	Yes	Yes	Yes
7. Connectivity A. Voice B. Data	Yes	Yes(4)	Yes (4)	Yes	Yes
8a. Position Available to Rescue Center	Yes	Yes	Yes/GPS	Yes	Yes
8b. In Future?	Now	Now	Now	Now	Now
9a. Position Accuracy 125m	Yes (6)	GPS	GPS	Yes (6)	Yes (6)
9b. Altitude?	Yes (6)	Yes	Yes (6)	Yes (6)	Yes (6)
10. Coverage and Service Total Global; GEO Global; GEO Regional; Non-GEO W/Limits Provide Limitations	GEO Global	GEO Global	GEO Global	GEO Global	GEO Global (Spot Beams)
11. Selective Polling	No	Yes	Yes	No	No
12. Alerting Time Less than 5 Minutes	Yes	Yes	Yes	Yes	Yes
13. Priority Access from Mobile Preemption?	Yes/Maritime No/Land Mob.	Yes	Yes/Maritime No/Land Mob.	Yes/Maritime No/Land Mob.	No
14. Priority Access to Mobile Preemption?	Yes/Maritime No/Land Mob.	Yes	Yes/Maritime No/Land Mob.	Yes/Maritime No/Land Mob.	Yes
15. Information Available from MSS Data Base	Yes	Yes	Yes	Yes	Yes
16. Situation Sort (Plane, Ship)	Yes	Yes	Yes	Yes	Yes
17. Mobile Unit Caller ID to Rescue Center When?	Yes (2)	Yes (2)	Yes (2)	Yes (2)	Yes (2)

Notes:
(1) All terminals have emergency prefix codes
(2) If RCC is equipped with FGD Signaling: otherwise through LES inquiry
(3) 9.6 kbps for fax, packet data 4.8 kbps
(4) To flight information regions or RCCs using table driven addressing
(5) 2-way data/store and forward
(6) Dependent on input from navigation system

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Table 2B
Little LEO MSS Post-Alert
Phase Capabilities Comparison

Capabilities	Final Analysis Communication Services Available 4Q 2000	LEO ONE Available 4Q 2000	ORBCOMM Available Now
1. 2-Way Data and/or 2-Way Voice	Both (1)	2-Way Data	2-Way Data
2. Facsimile	Limited	Limited	No
3. Still Images	Limited	Limited	No
4. Video Imagery	No	No	No
5. PSTN Compatible or PSDN Compatible	Both	Both	PSDN
6a. Position Available at Mobile	Yes/GPS	Yes/GPS	Yes/GPS
6b. Include Altitude?	Yes	Yes/GPS	Yes/GPS
7a. Transmit Position via MSS Link	Yes	Yes	Yes/GPS
7b. Include Altitude?	Yes	Yes	Yes
8. Position Accuracy 125m? Altitude?	Yes Yes	Yes/GPS YES	Yes/GPS
9. Selective Polling	Yes	Yes	Yes
10. Broadcast	Yes	Yes	Yes
11. Conference	Yes	Yes	No
12. Coverage and Service Total Global; GEO Global; GEO Regional; Non-GEO W/Limits (Provide Limitations)		Total Global	Total Global
13. Call Back Capability	Yes	Yes	Yes
14. Priority Access/Levels Voice/Levels Preemptive? Data/Levels/Preemptive?	N/A YES/3/?	N/A Yes/32/Yes	N/A Yes/4/?
15. Access Control (Voice)	N/A	N/A	N/A
16. 911 Call Capability	N/A	N/A	N/A
17. Provide Location and Identification to 911	N/A	N/A	N/A
18. Data Services Store and Forward?	Yes	Yes	Yes

Table 2C
COMSAT Post-Alert
Phase Capabilities

Capabilities	INMARSAT A&B Available Now	COMSAT AERO Available Now	INMARSAT C Available Now	INMARSAT M Available Now	Planet One Available Now
1. 2-Way Data and/or 2-Way Voice	Both	Both	2-Way Data	Both	Both
2. Facsimile	Yes	Yes	Yes	Yes	Yes
3. Still Images	Yes	Yes	Yes	Yes	Yes
4. Video Imagery	Yes	Yes	No	Yes	Yes
5. PSTN Compatible or PSDN Compatible	Both	Both	Both	Both	Both
6a. Position Available at Mobile	Yes	Yes	Yes	Yes	Yes
6b. Include Altitude?	Yes (2)	Yes	Yes (2)	Yes (2)	Yes (2)
7a. Transmit Position Via MSS Link	Yes	Yes	Yes	Yes	Yes
7b. Include Altitude?	Yes (2)	Yes	Yes (2)	Yes (2)	Yes (2)
8. Position Accuracy 125m? Altitude?	Yes (2)	Yes	Yes (2)	Yes (2)	Yes (2)
9. Selective Polling	Yes	Yes	Yes	Yes	Yes
10. Broadcast	Yes	Yes	Yes	Yes	Yes
11. Conference	Yes	Yes	No	Yes	Yes
12. Coverage and Service Total Global; GEO Global; GEO Regional; Non-GEO W/Limits Provide Limitations	GEO Global	GEO Global	GEO Global	GEO Global	GEO Global (Spot Beams)
13. Call Back Capability	Yes	Yes	Yes	Yes	Yes
14. Priority Access/Levels (3) Voice/Levels/Preemptive? Data/Levels/Preemptive?	Yes/4 (1)	Yes/4	Yes/4 (1)	Yes/4 (1)	Yes/3
15. Access Control	Yes	Yes	Yes	Yes	Yes
16. 911 Call Capability	Yes (4)	Yes (4)	Yes (4)	Yes (4)	Yes (4)
17. Provide Location and Identification to 911	Yes (4)	Yes (4)	Yes (4)	Yes (4)	Yes (4)
18. Data Services Store and Forward?	No	No	Yes	No	No

Notes:
(1) Maritime only
(2) Dependent on input from navigation system
(3) Priority access in maritime and aeronautical areas includes preemption
(4) Operator at Earth Station can dial 911 to forward call and provide location and identification information